96.B.12 24/2

96.H.H Box IV

Edinburgh: Museum

~~Ustad~~ Ali Mohamed.-

SCIENCE & ART DEPARTMENT NATIONAL ART LIBRARY

96.H.H Box IV

ON THE MANUFACTURE OF

MODERN KĀSHI EARTHENWARE TILES AND VASES

IN IMITATION OF THE ANCIENT

WRITTEN AT THE REQUEST OF

MAJOR-GEN. SIR R. MURDOCH SMITH, K.C.M.G.

BY THE INVENTOR

USTAD ALI MOHAMED
of Teheran

AND TRANSLATED FROM THE PERSIAN MS. BY

JOHN FARGUES
Assistant Superintendent English Telegraph Staff in Persia
Member of the Asiatic Society of Paris, etc., etc.

MUSEUM OF SCIENCE AND ART, EDINBURGH

1888

SCIENCE & ART DEPARTMENT
NATIONAL ART LIBRARY

2. 2. 89.

ON THE MANUFACTURE OF

KĀSHI EARTHENWARE.

THE Master, Ustād Ali Mohamed, the inventor of that process, son of Ustād Mahdi, architect, native of Ispahan, and at this date, A.H. 1305, a celebrity in Islam, has allowed the humble scribe, Mirza Ali Mohamed, to write a pamphlet displaying the secret and describing the process of the art; and as the best deeds are those which award most profit to the doer, the writer has wished to explain how to procure the ingredients and requisites of that beautiful art in order to acquire a good name amongst those who pursue it.

By order of the Master, the writer has divided the subject into five chapters.

CHAPTER I.

HOW TO PROCURE THE INGREDIENTS WITH WHICH THE COATING (LA'AB) IS MADE.

You gather glasswort (shoora-i-biābāni), and burn it till it turns into ashes. Its alkali (kelā) collects amongst the ashes. Take this alkali.

In the quarries is found a white stone which the Persians call seng-i-chekhmāq (a kind of flint). At Ispahan, in the river Zeyendeh-Rood, it is found in great quantity, the water carrying it down from the hills. In Nayin and Ardastan, two villages of Ispahan district, a very good quality of that stone and of shoora is found—in fact, this is the best of all places. The stone is to be found also at Koom; and in the neighbourhood of Tehran in a hill called Bibi-shahrbanoo.

Anyhow, procure the stone whencesoever you can, pound it fine with an iron hammer, then mix one part of it with an equal part of kelā (alkali), place it in the kiln, which heat.

Keep on making fire, and with an iron poker keep stirring the compound till the stone and kelā melt and flow into a basin which you have made under the kiln. On cooling, it will be found to resemble hard glass. It is called alkali-paint (rang-i-kolai). We must send you a sample.

Now with an iron hammer pound fine this alkali-paint glass (shisha-i-rang-i-kolai) and pass it through a fine sieve. Then procure two quarry stones, called "shahdanej," so hard as to resist calcination. Set up one of these stones, and with an iron bore make a round hole in the middle of the other, fit a wooden handle to its edge, place it upon the first, and pour gradually the sifted glass into the hole, twirling all the time the top stone until the glass-paint has become as fine as collyrium (surma). We will send a sample of this also as a criterion of the degree of fineness. Set aside this fine paint.

Melt in the kiln one maund of lead (surb) and one quarter maund of tin (gal). But I must explain how to do this. Take an earthen vessel, on its sides make two holes opposite to each other, place it in the kiln, throw in the lead and tin, stop up the mouth of the vessel, and heat the kiln so that the flame enters from the back hole of the vessel and comes out from the front hole in such a way that the fire clasps the lead and tin from above and below. Thus you keep on heating till the lead and tin melt. After melting, you decrease the fire gradually till the melted lead and tin give forth a froth (kurk), then you remove the lid of the vessel, and remove to one side the froth, again decrease the fire, froth is again formed which you remove as before, and so on gradually reducing the fire and taking off the froth until the whole of the lead and tin has turned into froth. You take it and bray it fine on a stone. Then take four parts of the previously mentioned refined paint and one part of this lead and tin (turned into froth and brayed), and mix them for a coating or varnish (la'āb). Keep this kind.

CHAPTER II.

HOW TO MAKE ANOTHER COATING (LA'AB) WHICH IS ESPECIALLY USED FOR WORK OF A SUPERIOR QUALITY.

You must take some of the above mentioned alkali (kelā), put it in a kettle (fatilcheh), place it on the fire and boil it (adding the necessary water). After boiling, pour it into an earthen bowl and leave it all night. Next morning you will find at the top the essence of the alkali or kelā, crystallized in form of ramifications like sugar candy (nabat), or winter ice—the refuse sinking to the bottom. Take this essence (jauher), which the master of our art calls "essence of alkali." Take one part of this, mix it with one part and a half of flint stone

(chekhmāq) very, very finely pounded—finer even than the former fine flint; pour as much as you like of this mixture in ten to fifteen earthenware vessels, and place them all round the kiln, thus filling up all the space round the kiln. Then you heat the kiln. At first, it will smoke a little, after two hours the smoke will cease, and the colour of the fire will turn red; heat again, and after another two hours the fire will become white. Then look: you will see the contents of the vessels melted and shrunk. Let the kiln cool, then remove the vessels, break them and preserve the contents, which is a kind of paint (la'āb), looking like hard glass. Pound it fine with an iron hammer, and then pass it through a sieve. Take four parts of this substance and one part of the froth of lead and tin prepared as before described, mix them, and again place the mixture in earthenware vessels and, as before, set them all round the kiln. Heat the kiln till at first the fire smokes, then turns red, then white, at which the contents of the vessels melt. You again let the kiln cool, remove the vessels, break them, and preserve the contents. This you pound with an iron hammer, pass through a sieve and bray—the finer the better. This paint or drug (la'āb or deva), is specially required for work of superior quality.

CHAPTER III.

HOW TO MAKE THE PASTE OF THE BRICKS OR VESSELS; WITH WHAT DIFFICULTY THE WORKMAN PROCURES THE INGREDIENTS AND WORKS THEM UP, &c.

Pound with an iron hammer some of the before-mentioned flint stone (chekhmāq), and pass it through a sieve, then bruise it well in the mill-stone, which I have above described, till it becomes fine—the finer the better.

We have a kind of clay of a white colour, the mine of which is at the village of Vartoon in the Ispahan district. The master of our art calls it fire-clay (gil-i-bootah—literally, crucible-clay). It is to be found at Tehran also, but not of such good quality. Put some of this clay in water, so as to form a sort of whey-water (doogh-ab) and pass it through a rag. Now take eight parts of powdered flint stone (chekhmāq), one part of dry fire-clay (gil-i-bootah), and one part of that stone and alkali which you had first burnt with the refuse. (This refers to the first la'āb, in 1st chapter, *i.e.*, the kelā and chekhmāq stone, well bruised.) Mix the three together, and with the doogh-ab make a paste—owing to the presence of the gil-i-bootah they will stick together. Take a handful of this paste, roll it out on a flat hard surface, and, with a mould made of plaster, shape your bricks until all the paste is used up: let the bricks dry. If you wish to make figures or flowers in relief on the bricks, you must, while

they are still a little damp, smooth the surface with a special tool (abzar-i-makhsooseh), and with a plasterer's engraving tool (qalam-i-gachbur) make your designs. When dry and before applying the colours (neqqashi) the bricks require a coating (la'āb) which is made as follows:—Bray some very white chekhmāq stone in the manner before mentioned, take one part of it and one-eighth of gil-i-bootah, mix them together with water in an earthenware vessel till they form a solution (dooghab), wash with a damp rag the surfaces of any bricks which have dried up, and then spread the above solution over the bricks to the thickness of a tin plate, keep the bricks inclined to let the excess drain off, and then set them to dry.

CHAPTER IV.

DIFFERENT COLOURS APPLIED TO, AND VARIOUS DESIGNS MADE UPON, BRICKS AND VESSELS. HOW TO PROCURE AND MIX THE INGREDIENTS OF THE DIFFERENT COLOURS, &c.

First, procure a stone which men of the craft call "siah-qalam-i-ma'dani," and also another stone called "maghn." To as much as you like of the former you add one tenth the quantity of the latter, add water and bruise on a soft flat stone until the mixture becomes like syrup of grapes (shireh), pour into a vessel and add a few drops of syrup of grapes. With this you paint (using a hair pencil) on the bricks prepared as above described any figure or design your wish or taste may suggest.

Now let us go back to the various colours which you require for your flower, figure, or whatever you have designed. Now, my friend, listen attentively, by order of the master of this craft I will give you a receipt with which you can do anything you like.

Put half a miscal of gold in aquafortis (tizab), dissolve a quarter miscal of tin (gal) in about a bowl (kasseh) of aquafortis, then pour the two solutions into an earthenware vessel containing five maunds of water. The water will turn red (qermez) verging to black, mix with it thirty-two miscals of crystal glass well pounded to the fineness of collyrium (surma), it will then throw up a red froth which will subside, pour away the water which is at the top, put four miscals of dross of gold (murdeh-sang-i-tela) with the deposit—(to melt gold one uses lead and water, when the melted gold is removed, the refuse lead, water, and dross of gold is the murdeh-sang-i-tela meant here)—add also two miscals of "tanagār" (a dissolvent similar to borax), bray the whole well, and with a hair pencil you may paint with this "deva" any part of your sketch which you wish to come out red.

Now for what you wish to colour in cerulean (lajverdi). In the environs of Kashan is a hill with a mine of lapis-lazuli

(lajverd-khak); the lapis breaks out of the hill like blossoms. Every few years the inhabitants of Kashan collect some of this blossomed earth and make it into bud-shaped balls. Men of the craft buy these lapis-lazuli buds, pound them and add half the quantity of Yezd borax (booreh-i-Yezd) such as goldsmiths use, and half the quantity of essence of "tanagār" which blacksmiths use, and which comes from Khorasan. The three mixed together you put in an earthenware vessel, place it in the kiln, heating it till, as in previous cases, the compound melts. Let the kiln cool, remove the vessel and break it, break open also the contents which will be found to enclose a white substance like silver. Keep this and throw away the rest. Take now one part of this silver-like substance, one part of these raw lapis-lazuli balls, and one part of chekhmāq stone, finely pounded, mix and bray all three very fine. This is the cerulean colour, as men of the craft like it. If the colour be too deep add some finely-bruised chekhmāq stone—the more of which you add the paler will be the colour.

If you want a turquoise colour (rang-i-firoza) know that when copper is heated and hammered it gives off a dross (risesh). Mix one part of this dross, well pounded, with half a part of pounded chekhmāq stone and you obtain turquoise colour, any place you paint with it coming out of the fire turquoise colour.

If you want violet colour, take one part of the red colour above described, and mix with it one third part of cerulean, bray the mixture and you have violet colour.

If you pound the "maghn" stone raw, and paint with it, you will have iris-violet (benefsh-i-zanbaki).

For yellow colour, men of the craft procure from Khorasan a kind of clay called ukhrā (ochre). They extract the essence of the refined part of it, which when pounded becomes yellow paint.

Another kind of yellow colour is procurable at the alchemists (meshshaq).

Green colour is also procured, if necessary, from the alchemists.

CHAPTER V.

VARNISH (LA'AB) AFTER APPLYING THE COLOURS.

Now we must write a chapter about the varnish (la'āb) which is put on the bricks after the colours have been applied. Take a little of those two kinds of varnish which we have made, cooked, and put aside in Chapters I. and II., place it in an earthenware vessel, take some gum arabic (katira), infuse it, clear it, and add it to the varnish, mix, adding water until the compound becomes as fluid as doogh-water. Then spread this varnish over the bricks, keeping them inclined so that the excess

may run off, then lay the bricks horizontal to dry; when dry, set them round the kiln, as you would set looking-glasses, and apply the fire. The master of the craft says, first for two hours make a light fire till the surface of the bricks gets black, then increase it a little for two hours when the black changes to red, then for three hours make a moderate fire, that is not too strong so as to produce smoke, and not too light lest the colours dry up again; this fire must be kept on till the varnish becomes clear. At this point stop the opening of the kiln and let it cool down for two or three days when the bricks may be removed.

This first process is finished. It is the work of our master, and is known as drawing under varnish (naqsh-zir-la'āb). The fuel you burn in the kiln must be white and dry wood, in order to avoid too much smoke.

END OF PART I.

PART II.

SEVEN-COLOURS PROCESS.

FROM the master of the craft we have learned another process which is known as the "seven-colours process" (haft-rang-sazi). It is of two kinds; one consists in making each brick of one uniform colour, the other in making one brick of seven colours.

Should you wish to make vases, the paste must be of the chekhmāq stone, before mentioned, and if you wish to make bricks of seven colours, or of one uniform colour, you may make them with potter's clay (khak-i-russ), provided that in order to decrease the strength of the potter's clay you mix with it a little sand, which Persians call "masseh," or even a little ashes. Aye, my friend, to make vases you must pound the stone as before, but if for easiness sake you make bricks of potter's clay, mixed with ashes, you may do so, there is no harm. If you want to make vases you take chekhmāq stone, well pounded, fire-clay (gil-i-bootah), and the stone and alkali (kelā) previously mentioned, mix them together as we have before taught you so as to form a paste, and on the potter's wheel turn it into the shape of a vase.

To make a brick, the master takes a wooden mould, fills it with potter's clay, well handled, and mixed with ashes or sand, then with a wire he cuts off the excess of paste; he then turns the mould over on the ground and so leaves it for twenty-four hours. Next day he removes the mould, beats and presses the brick on a flat stone to smooth its surface, then places it upright against the wall so as to dry without warping. When dry, he rubs the surface with a damp rag and begins colouring.

CHAPTER I.

HOW TO MAKE COLOURS SPECIAL TO THE "SEVEN-COLOURS PROCESS" FOR BRICKS OR VASES.

Bray as before, three parts of lead and one of tin, add to them six parts of that glass-like paint, before mentioned, put all in a vessel of water with a little clear gum arabic. With this paint the brick uniformly, place it in the kiln—using only half the previous degree of heat for this the "seven-colours process." On removing the brick from the kiln it will be found to be white—the effect of the above drug.

If you want a turquoise colour, add to that colour which has come white out of the kiln, one-sixteenth of copper dross (tufaleh-i-mes — the pieces which chip off when copper is hammered)—place it in the kiln and heat. It will come out a turquoise colour.

If you want a yellow colour, take sixteen parts of lead and one of tin, melt them together, take the froth (kurk) and heat it; when it begins to melt, add a quarter of its quantity of well-brayed stone, and mix thoroughly. Bricks or vases painted with this preparation and heated, will come out of the kiln a yellow colour—like a servant who has acted perfidiously, and who, as is well known, turns yellow. With an iron ladle (sikh), skimmer-like, you must take out that yellow colour when melting, bray it, mix it with solution of gum arabic (la'āb-i-katira), and apply it to bricks or vases. This requires only half the heat of other colours.

If you want a black colour (meshki), mix and bray together three parts of crystal glass, four parts of the glass-like paint, and one part of "maghn" stone; add some liquid gum arabic, and eight miscals of essence of alkali well bruised. This requires the same degree of heat as the white colour, and comes black out of the kiln.

If you want a cerulean colour, this is the process. Take five seers or one part of lapis-lazuli raw, fifteen seers or three parts of crystal glass, four parts of the glass-like paint, one miscal of essence of lapis-lazuli, and eight miscals of essence of alkali; bray the whole, adding clear liquid gum arabic and water. Apply this to bricks or vases, place them in the kiln with full heat. They will come out of a cerulean colour.

If you want a green colour, bray and mix one part of copper dross, three parts of vermilion (surenj), six parts of crystal glass, six parts of chekhmāq stone, and six parts of the glass-like paint, add water, apply to bricks or vases, heat them in the kiln, and they will come out green.

If you wish to have a red colour (qermez), take half a miscal

of gold in a vessel containing aquafortis (tizab), dissolve six nukhuds of tin in aquafortis in a separate vessel, fill an earthenware vessel with water, add the gold solution, and stir briskly; now add the tin solution. It will turn the water red, verging to black; add thirty seers, Tabriz weight, of pounded crystal glass. The water will give forth a froth and make a sediment, throw away the water, add to the sediment about thirty seers of the glass-like paint, mix all well. Bricks or vases painted with this compound (deva) will, when heated in the kiln, come out red.

If you mix one part of this red paint with four parts of cerulean colour, you get a violet paint (benefsh).

Again, put iron filings (suvaleh-i-ahen) in aquafortis, and let them stand for some days; they will have a chemical action on each other (eat each other) and become the iron saffron (zaferan-ul-hadid—burnt green vitriol), mix with water and use as paint, it will give an orange or jujube colour (naranji or annabi).

CHAPTER II.

SEVEN COLOURS ON ONE BRICK.

But if you want one brick to come out with seven colours—(this does not mean superposed colours, as in the "Reflet," but seven designs, each with a different colour)—you must first prepare the seven colours and test them, counterbalancing the moisture and dryness of the ingredients, so as to obtain equilibrium. Then you begin, following the direction of the master I have written it all down.

Know first, that a brick which comes out of the kiln white, is fit to receive the seven colours. Now let us make anew the colours, so as to get colours special to the seven-coloured bricks. First, take two miscals of essence of lapis-lazuli, four miscals of bud-like balls of raw lapis-lazuli, thirty miscals of pounded crystal glass, thirty miscals of pounded chekhmāq stone, thirty miscals of tanagār, thirty miscals of essence of alkali; bray all together, put in an earthenware vessel, and place it in the kiln; heat up, take out, break the vessel, bray the contents, and add water. This is the cerulean of the seven-coloured process.

As for the yellow colour, it is the same here as what you made for the uniform (single) colour process.

When you want a green colour, take four miscals of copper, four miscals of lapis-lazuli, thirty miscals of crystal glass, thirty miscals of flint stone, thirty miscals of essence of alkali, thirty miscals of saltpetre (shoora-i-qalam); mix all in a vessel, put in the kiln, take out, break the earthenware vessel, bray the contents, apply it to a white brick, and it will come out green.

For turquoise, you must take four miscals of copper, four of lapis-lazuli, thirty of crystal glass, thirty of flint stone, thirty

of essence of alkali, and thirty of saltpetre; put in a vessel and bake. It will come out turquoise paint.

For black—Take four miscals of "maghn," thirty of crystal glass, thirty of chekhmāq stone, thirty of essence of alkali, thirty of saltpetre; mix in a vessel, bake, bray, and you will have black paint.

For red—Take half a miscal of gold in aquafortis, also six nukhuds of tin (gal) in other aquafortis, fill a bowl with water and add the gold solution, stirring briskly, next add the tin solution, stirring it with your hand, the froth will set, pour away the water; add half a Tabriz maund or 320 miscals of crystal glass and 110 miscals of "tanagār," and bake in an earthenware vessel. The compound will be red paint.

For violet (benefsh), mix four parts of this red colour and one part of cerulean (lajverd), and you will get violet paint.

The method of testing is this; paint those seven colours (separately) on a piece of brick, and place it in a portable kiln, which you heat. Taking the brick out, examine it, any colour which is dry, unclear, dull, must be increased in moisture according to the degree which each requires. After thus regulating the strength of the colours (raising what is too low, lowering what is too high), apply all the seven colours separately, by making a design with each, on a brick or vase, and cook it in the kiln in the way before described.

These seven-colour bricks want only half the degree of heat required for the previous process. Let the kiln cool down for forty-eight hours, then draw out.

This is called the seven-colour process (haft-rang-sazi), and supercoloration, or kar-rooi-rang.

The pamphlet is finished. To him who ordered it, and to the master of the craft

HAIL!

Tehran, 1888.

N.B.—

1 maund, Tabriz weight, = 40 seers.
1 seer, Tabriz weight, = 16 miscals.
1 miscal, Tabriz weight, = 24 nukhuds.

NATIONAL ART LIBRARY

Collated, perfect.
12. XII. '94. H.B.